REMARKS

I. Introduction

In response to the pending Office Action, Applicants have added new claims 17 and 18. Support for new claims 17 and 18 may be found, for example, on page 22, line 19 to page 23, line 1 of the specification. The Title has been amended. Applicants have taken care to avoid the introduction of new matter.

Applicants respectfully submit that all pending claims as currently amended are patentable over the cited prior art.

II. The Patentability Of Claims 1-6 and 8-16

Claims 1-6, 9, 11, 13 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yonemura (JP 2003-346888) in view of Ohba et al. (USP No. 5,989,750) and Haruno et al. (JP 08-236101) and further in view of Doi et al. (USP No. 4,210,709); and claims 8, 10, 12, 14 and 16 as being unpatentable over Yonemura, Ohba, and Haruno and further in view of Carlisle (USP No. 3,227,583). Applicants traverse the above rejections for at least the following reasons.

With regard to the present disclosure, independent claims 1 and 10 recite a lead storage battery which includes an electrode plate pack comprising a plurality of negative electrode plates which each comprise a negative electrode grid having a tab and a negative electrode active material layer retained by the negative electrode grid. The battery also includes a plurality of positive electrode plates which each comprise a positive electrode grid having a tab and a positive electrode active material layer retained by the positive electrode grid, and a plurality of separators separating said positive electrode plate and said negative electrode plate. A positive

electrode connecting member comprises a positive electrode strap to which the tab of each positive electrode plate of the electrode plate pack is connected, and a positive electrode pole or a positive electrode connecting body provided at the positive electrode strap. A negative electrode connecting member comprises a negative electrode strap to which the tab of each negative electrode plate of the electrode plate pack is connected, and a negative electrode pole or a negative electrode connecting body provided at the negative electrode strap. The positive electrode grid, the negative electrode grid, the positive electrode connecting member, and the negative electrode connecting member comprise a Pb-alloy including at least one of Ca and Sn. The negative electrode active material layer includes Sb. The separator includes silica and contains 5.0 to 30 % by mass of an oil, and the electrode plate pack, the positive electrode strap, and the negative electrode strap are immersed in an electrolyte.

One feature of the present disclosure is that the electrode plate pack, the positive electrode strap, and the negative electrode strap are immersed in an electrolyte. As is shown in FIG. 1 of the drawings, the electrolyte level is set so that the positive electrode strap 6, the electrode plate pack 11 and the negative electrode strap 5 are immersed in the electrolyte. Accordingly, since oil flowing out of the separator moves to a liquid surface of the electrolyte positioned on an upper side than the electrode plate pack, and since the oil does not exist between the positive 2 and negative 3 electrode plates and electrolyte, then even if the oil flows out from the separator during use, the oil would not adversely affect the electrodes.

It is asserted in the Office Action that it would have been obvious to immerse the electrode group structure formed from a Pb-Sn alloy in an electrolyte because Haruno teaches that it improves the corrosion resistance at high temperature by forming a Pb-Sn alloy layer. It is

also asserted that it would have been obvious to include oil in the separator based on the teachings of Doi. Applicants respectfully disagree.

It is true that Doi discloses the use of oil in the process of forming a microporous film (see, col. 8, lines 47-55 of Doi). However, Yonemura is directed toward a method for suppressing the corrosion of negative electrode tabs when electrodes are exposed from the electrolyte due to electrolyte loss caused by repeated charge/discharge cycles. Yonemura, in ¶ [0004], recites that "when the negative electrode tabs with Sb deposited thereon are exposed from the electrolyte, the negative electrode tabs corrode at the surface and become thin, so that the strength of the tab lowers." Thus, if Yonemura is combined with Doi having an oil-containing separator, the oil on the surface of the electrolyte may adversely affect battery performance. As such, one skilled in the art would not be motivated to combine Yonemura with Doi, because while the inclusion of oil in the separator may result in good wettability and water absorption, it may also adversely affect battery performance.

In contrast, the present disclosure avoids the above problems by using lead-acid batteries at relatively low SOC (50-90%) as discussed on page 2, lines 4-22 and page 54, lines 5-26 of the present specification. When lead-acid batteries are used in such a mode, they are unlikely to be overcharged, and therefore, the amount of electrolyte is reduced. Thus, the electrolyte level is kept high and the corrosion of the electrode tabs is suppressed without the above-mentioned effect from the oil.

Moreover, Haruno does not teach or suggest immersing the electrode plate pack, positive electrode strap, and negative electrode strap in an electrolyte. As is disclosed in ¶ [0014] of Haruno, the batteries A, B, and C were charged at a constant voltage of 13.8 V at 90 °C for 6

weeks, *with their straps exposed from the electrolyte* in order to keep the batteries at overcharge conditions. This was done to evaluate corrosion of the negative electrode grid tabs. In addition, Haruno states in ¶ [0005] that "as the output of engines is becoming increasingly high, the temperatures of environments in which car batteries are used also become high. It has become clear that the *corrosion resulting from exposure of the negative electrode strap from the electrolyte* in such high-temperature environments *cannot be suppressed* by conventional methods." Thus, Haruno does not disclose immersing the electrode strap in electrolyte, nor does Haruno suggest using lead-acid batteries at relatively low SOC. Haruno intends to limit exposure of the electrode strap to immersion in electrolyte.

In view of the above, it is clear that one skilled in the art would not be motivated to combine Yonemura, Ohba, Haruno, Carlisle and Doi to achieve the limitations of claims 1 and 10, and therefore, the combination does not render independent claims 1 and 10 obvious. Thus, Applicants submit that independent claims 1 and 10 of the present disclosure are allowable and patentable over the cited prior art.

III. All Dependent Claims Are Allowable Because The Independent Claim From Which They Depend Is Allowable

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claims 1 and 10 are patentable for the reasons set forth above, it is respectfully submitted that all pending dependent claims are also in condition for allowance.

Moreover, new claims 17 and 18 are dependent upon claims 1 and 10, respectively. As claims 1 and 10 are allowable and patentable over the cited prior art as indicated above, Applicants submit that new claims 17 and 18 are also allowable over the cited prior art for at least the same reasons, an indication of which is respectfully solicited.

IV. Conclusion

Having responded to all open issues set forth in the Office Action, it is respectfully submitted that all claims are in condition for allowance.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP

Nathaniel D. McQueen
Registration No. 53,308

Please recognize our Customer No. 53080 as our correspondence address.

600 13th Street, N.W.
Washington, DC 20005-3096
Phone: 202.756.8000 NDM:kap
Facsimile: 202.756.8087
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